

NCERT *Solutions* CHEMISTRY

Chapter 1 : Matter in Our Surroundings

Class

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Chapter 1

Matter in our Surroundings

Questions:

Q. 1 Which of the following are matters?

Chair, air, love, smell, hate, almonds, thought, cold, cold drink, smell of perfume.

Answer : Anything which occupies space and has mass is called matter.

There are three states of matter:- solid, liquid, gas. Chair, almonds: solid since they have definite shape and mass.

Cold drink: liquid since it has fixed volume.

Air, Smell of the perfume, smell: gas matter since they are gases.

The smell is a state of the matter since it is due to the presence of some vapour state substance in air which occupy space & have mass due to which there is smell.

Hence, Chair, Almonds, Cold drink, smell, the smell of perfume and Air are examples of the matter.

Q. 2 Give reasons for the following observations: The smell of hot sizzling food reaches you several meters away but to get the smell from cold food, you have to go close.

Ans.: The smell of hot sizzling food reaches you several meters away but to get the smell from cold food due to very high rate of diffusion of hot aroma particles of the food in the air as compared to the particles of cold food, due to the high speed of particles and large space between them,

gases show the property of diffusing very fast into other gases at high temperature as compare to low temperature.

Q.3 A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?

Ans.: The diver is able to cut through water in a swimming pool because of the property of the matter have space between them.

Explanation: Water in the swimming pool is an example of the liquid state of matter, as a result, particles in the water move freely and have greater space between each other as compared to particles in the solid state. Thus, the diver is able to cut through the water in a swimming pool.

Q.4 What are the characteristics of the particles of matter?

Ans.: Anything which has mass and occupies space is called matter. The important characteristics of the particles of matter (atoms or molecules) are following:

(i) The particles of matter have spaces between them known as inter molecular space. Particles of one type of matter are able to get into the spaces of the particles of other. For example, when we dissolve salt or sugar in water, the particles of sugar or salt get evenly distributed in water.

(ii) The particles of matter are constantly moving as they possess kinetic energy. With the increase in temperature, particles move faster. As a result, the kinetic energy of the particles also increases.

(iii) The particles of matter attract each other. They have force of attraction acting between them. This force helps to keep the particles of matter together. The strength of this force of attraction depends on the nature of matter. This is known as inter molecular force of attraction

Questions:

Q.1 The mass per unit volume of a substance is called density (density = mass/ volume).

Arrange the following in order of increasing density:

Air, Exhaust from chimneys, Honey, Water, Chalk, Cotton and Iron

Ans.: Density is mainly determined by the intermolecular forces of attraction

Solids have high intermolecular forces of attraction, as a result, they have high density followed by liquids and gases which have less intermolecular forces of attraction. We can draw the following inference:-On the basis of the above information the order of increasing densities of the given substances is:

Air (gas) < Exhaust from chimneys (condense gas) < Cotton(light porous solid) < Water (liquid) < Honey(Thick liquid) < Chalk(heavy porous solid) < Iron(solid).

Q.2(A) Tabulate the differences in the characteristics of the three states of matter.

Ans.: The main differences in the characteristics of the three states of matter, solids, liquids and gases are given below:

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Solids	Liquids	Gases
(i) Solids have distinct boundaries which helps them to maintain a fixed shape and volume.	(i) Liquids do not have distinct boundaries and have no fixed shape. Liquids have fixed volumes. They take the shape of the container in which they are placed.	(i) Gases have neither a fixed shape nor a fixed volume. They acquire the shape and volume of the container in which they are kept.
(ii) Solids cannot be compressed much. They have a tendency to maintain their shape when subjected to outside force. The forces of attraction between the particles are maximum.	(ii) Like solids, liquids cannot be compressed much. The forces of attraction between the particles are moderate.	(ii) Gases can be compressed easily (into a small volume). The force of attraction between the particles of gas are minimum as compared to solids and liquids.
(iii) Solids have high densities. They are densely packed.	(iii) Liquids have moderate to high densities. They are usually less dense than solids.	(iii) Gases have very low densities. A gas is much lighter than the same volume of a solid or a liquid.
(iv) Solids do not fill their container completely. The particles in solids are packed closely and are not able to move freely. They have fixed positions.	(iv) Liquids do not fill their container completely. The particles in liquids are moderately packed. They have a fixed volume.	(iv) Gases fill their container completely. The particles in a gas do not have fixed positions and are able to move freely. Because of weak forces of attraction among the particles,

		they do not have fixed volumes. As a result, gases fill their container completely.
(v) Solids do not flow because they have rigid boundaries.	(v) Liquids generally flow easily because they are not rigid and take the shape of the container in which they are kept.	(v) Gases flow easily. They do not have rigid shape and fixed volume.

Q.2(B) Comment upon the following:

Rigidity, Compressibility, Fluidity, Filling a gas container, Shape, Kinetic energy and Density.

Ans.:

(i) Rigidity

Property of the Substance to retain/maintain their shape when subjected to outside force is known as rigidity.

This property is determined by the inter molecular force of attraction.

(ii) Compressibility

The particles of matter have intermolecular spaces. If an external force is applied, it can bring these particles closer.

The property of a fluid or a solid due to which its volume decreases when pressure is applied is called Compressibility.

Gases have high compressibility because they have a lot of inter molecular spaces.

The particles in solids and liquids are closely packed, so solids and liquids do not have much compressibility.

(iii) Fluidity

The tendency of the particles to flow is known as its fluidity.

Gases and liquids exhibit the property of fluidity, so they are called fluids.

This property is determined by intermolecular force of attraction as well as intermolecular spaces.

Due to large intermolecular spaces and very weak forces of attraction, gases can flow very easily followed by liquids and then solids which have almost negligible fluidity.

(iv) Filling a gas container

A gas is able to fill the container because its particles are able to vibrate randomly in all the directions.

The particles of gas have very high kinetic energy and almost negligible forces of attraction.

As a result, gases are able to fill the container fully.

(v) Shape

The external form or appearance of a substance is called its Shape.

The particles in a solid have very strong forces of attraction due to which they are closely packed so they have a fixed shape.

The liquids and gases have comparatively weaker forces of attraction between them as a result they take the shape of container in which they are stored.

(vi) Kinetic energy

The energy possessed by particles due to their motion is called kinetic energy.

At a given temperature, the particles of gas have the maximum kinetic energy.

Liquids have lesser kinetic energy as compared to gases whereas solids have the least kinetic energy at a given temperature.

(vii) Density

The mass per unit volume of a material is called its density.

Solids have high densities because of strong forces of attraction.

Liquids usually have lower densities than solids because their particles are loosely packed as compared to solids.

Gases have the lowest densities because their particles are very far away from one another due to weakest forces of attraction among them.

Q.3 Give reasons:

- (a) A gas fills completely the vessel in which it is kept.
- (b) A gas exerts pressure on the walls of the container.
- (c) A wooden table should be called a solid.
- (d) We can easily move our hand in air but to do the same through a solid block of wood, we need a karate expert.

Ans.:

(a) A gas is able to fill the container because its particles are able to vibrate randomly in all the directions due to high kinetic energy as result they fill up the vessel completely in which they are kept.

(b) The particles of a gas have very high kinetic energy. They move randomly with high speeds in all directions. Due to this random movement, the particles hit each other and also the walls of the container. As a result, a gas exerts pressure on the walls of the container.

(c) A wooden table has a definite shape and a definite volume. The particles in a wooden table are tightly packed and have no intermolecular spaces and hence, it cannot be compressed. Since, a wooden table has the basic characteristics of a solid i.e. rigidity, definite shape and definite volume, it should be called a solid.

(d) We can easily move our hand in air but not do the same through a solid block of wood because of the differences in the intermolecular forces of attraction. Air has very low intermolecular force of attraction as result even small amount of force can separate air particles whereas in case of solids the intermolecular force of attraction are very strong and large amount of force is required to break them. This is the reason we can easily move our hand in air but t do the same through a solid block of wood we need a karate expert

Q. 4 Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Find out why?

Ans.: The density of water is greater than ice cubes, hence ice cubes are lighter than water. This is why ice cubes are floats on water.

When water is in the solid state, it has dominant hydrogen bonds between its molecules which are very strong.

In this state, when the water molecules come close to each other, the molecules are forced to arrange themselves into a certain structure - a

hexagonal lattice that is the basis for the shape of the six-sided snowflakes.

So density is mass per volume so due to the increased bond angles and expanded molecular structure and, the volume is greater and the density is lower.

Questions:

Q.1 Convert the following temperatures to Celsius scale:

(a) 300 K

(b) 573 K

Ans.: (a) Kelvin is the SI unit of temperature. To change a temperature on the Kelvin scale to the Celsius scale you have to subtract 273 from the given temperature, and to convert a temperature on the Celsius scale to the Kelvin scale you have to add 273 to the given temperature.

Temp. on Kelvin scale = Temp. on Celsius scale + 273

300 K = Temp. on Celsius scale + 273

Temp. on Celsius scale = $300 - 273 = 270^{\circ}\text{C}$

Thus, a temperature of 300 K on Kelvin scale is equal to 270°C on Celsius scale.

(b) Kelvin is the SI unit of temperature. To change a temperature on the Kelvin scale to the Celsius scale you have to subtract 273 from the given temperature, and to convert a temperature on the Celsius scale to the Kelvin scale you have to add 273 to the given temperature.

Temp. on Kelvin scale = Temp. on Celsius scale + 273

$573 = \text{Temp. on Celsius scale} + 273$

And, Temp. on Celsius scale = $573 - 273 = 300^{\circ}\text{C}$

Thus, a temperature of 573 K on Kelvin scale is equal to 300°C on Celsius scale.

Q.2 What is the physical state of water at:

(a) 250°C?

(b) 1000C?

Ans.: (a) Water will be in gaseous state at 250°C. The boiling point of water is 100°C. Heating the water above this temperature will change it into gaseous state.

(b) The boiling point of water is 100°C. At this temperature the liquid starts changing into gas. Boiling is a bulk phenomenon. Particles from the bulk of the liquid gain enough energy to change into the vapour state. Hence, the physical state of water at 100°C will be both 'liquid' and 'gaseous' state.

Q. 3 For any substance, why does the temperature remain constant during the change of state?

Ans.: The temperature remains constant during the change of state because the heat supplied is used up in changing the state of matter as it has to work against the force of attraction of molecules.

Q.4 Suggest a method to liquefy atmospheric gases.

Ans.: Atmospheric gases can be liquefied by applying pressure and reducing the temperature. When pressure is applied on a gas at a reduced temperature, its molecules get closer and they start attracting one another to form a liquid. When a gas is compressed by applying high pressure, a lot of heat is produced. So, while applying high pressure, it is necessary to keep the temperature low which helps to take away the heat released during compression.

Questions:

Q. 1 Why does a desert cooler cool better on a hot dry day?

Ans.: The outer walls of the cooler are constantly sprinkled by water. This water evaporates at a faster rate during the hot dry weather causing a cooling effect in the inside air of the cooler which is sent in the room through a fan. On a hot dry day, humidity is very low so the cooler works efficiently

Q.2 How does the water kept in an earthen pot (matka) become cool during summer?

Ans.: Earthen pot is porous with a lot of pores on it. The water oozes out of these pores constantly. This water then gets evaporated through the pores quickly. Since, some heat energy is taken from the water during the process of evaporation. This process makes the pot cold which further cools down the water inside the pot.

Q.3 Why does our palm feel cold when we put some acetone or petrol or perfume on it?

Ans.: Acetone, petrol and perfume are volatile liquids. They change into vapours easily when they come in contact with the air. In order to change from the liquid to the vapour state, acetone, petrol or perfume requires latent heat of vaporisation. These liquids absorb this latent heat of vaporisation from our palm. As a result, heat energy is lost from the palm and it feels cold.

Q.4 Why are we able to sip hot tea or milk faster from a saucer than a cup?

Ans.: When hot tea or milk is taken in a saucer, its surface area is increased. Since, evaporation is a surface phenomenon. The rate of evaporation becomes faster with the increase in surface area. Tea or milk cools down faster in a saucer making it easier for a sip. On the other hand, when hot tea or milk is taken in a cup, surface area is comparatively small due to the narrow shape of the cup. Small surface area slows down the process of evaporation. Hence, tea or milk takes long time to cool in a cup which makes it difficult to take a sip.

Q.5 What type of clothes should we wear in summer?

Ans.: We should wear light colored cotton clothes in hot summer to keep us cool and comfortable.

- Light colour is preferred because it reflects heat. Because of our body mechanism we tend to perspire more during summers. This helps to keep our body cool. During evaporation, the particles at the surface of the liquid gain energy from the surroundings or body surface and change into vapour.
- The heat energy equal to the latent heat of vaporization is absorbed from the body leaving the body cool.
- Cotton, being a good absorber of water helps in absorbing the sweat and exposing it to the atmosphere and makes evaporation easy.

Exercise

Questions:

Q. 1 Convert the following temperatures to the Celsius scale:

(a) 293 K

(b) 470 K

Ans.: (a) Kelvin is the SI unit of temperature. The Relation between Kelvin and Celsius is as follow:-

Temp. on Kelvin scale = Temp. on Celsius scale + 273

According to Question:-

293K = Temp. On Celsius scale + 273.

∴ On Celsius scale = $293 - 273 = 20^{\circ}\text{C}$.

Therefore, 293 K is equal to 20°C .

(b) Kelvin is the SI unit of temperature. The Relation between Kelvin and Celsius is as follow:-

Temp. on Kelvin scale = Temp. on Celsius scale + 273

According to Question:-

470k = Temp. On Celsius scale + 273

∴ Temp. on Celsius scale = $470 - 273 = 197^{\circ}\text{C}$.

Therefore, 470 K is equal to 197°C .

Q.2 Convert the following temperatures to the Kelvin scale:

(a) 25°C

(b) 373°C

Ans.: (a) Kelvin is the SI unit of temperature.

Temp. on Kelvin scale = Temp. on Celsius scale + 273

Temp. on Kelvin scale = $25^{\circ}\text{C} + 273 = 298\text{ K}$

Therefore, $25^{\circ}\text{C} = 298\text{ K}$

(b) Kelvin is the SI unit of temperature.

Temp. on Kelvin scale = Temp. on Celsius scale + 273

= $373^{\circ}\text{C} + 273 = 646 \text{ K}$

Therefore, $373^{\circ}\text{C} = 646 \text{ K}$

Q. 3 Give reasons for the following observations:

(a) Naphthalene balls disappear with time without leaving any solid.

(b) We can get the smell of perfume sitting several metres away.

Ans.: (a) Naphthalene is a volatile organic compound which can undergo sublimation. It directly changes into vapour state without leaving any solid. The naphthalene balls sublimate completely forming naphthalene vapours and hence, they disappear without leaving any solid residue.

(b) Perfume contains a volatile solvent which diffuses into the air. When liquid perfume is applied, it quickly changes into vapours. As a result of diffusion, the perfume vapours move very rapidly in all directions in air, mix up with air particles and spread in the air. When this air containing perfume vapours reaches several meters away, we can smell the perfume.

Q. 4 Arrange the following substances in increasing order of forces of attraction between the particles - water, sugar, oxygen.

Ans.: The forces of attraction between the particles of a gas is minimum, intermediate in case of a liquid and are maximum in a solid. On the basis of this information we can arrange the following substances in increasing order of forces of attraction which is as follow:-

oxygen < water < sugar

*For Extra Information

(i) Oxygen is a gas, the forces of attraction between its particles will be the weakest.

(ii) Water is a liquid. The forces of attraction between its particles will be stronger than that of oxygen but will be weaker than that of sugar.

(iii) Sugar is a solid. The forces of attraction between its particles will be the strongest.

Q.5 What is the physical state of water at:

(a) 25°C (b) 0°C (c) 100°C

Ans.: (a) Between 0°C and 100°C water exists as a liquid. The physical state of water at 25°C is liquid.

(b) 0°C is the melting point of ice as well as the freezing point of water. Hence, the physical state of water can be both liquid and solid at 0°C .

(c) 100°C is the boiling point of water as well as the condensation temperature of steam. Hence, the physical state of water can be both liquid or gas at 100°C .

Q. 6 Give two reasons to justify:

(a) Water at room temperature is a liquid.

(b) An iron almirah is a solid at room temperature.

Ans.: (a) The freezing point of water is 0°C and the boiling point of water is 100°C . At room temperature the particles of water do not have enough energy to break free from the inter-molecular force of attraction of each . Hence, water remains as a liquid at room temperature.

(b) An iron almirah is solid at room temperature because melting point of iron i.e the temperature required to convert solid iron to liquid iron is much higher than the room temperature

Q.7 Why is ice at 273 K more effective in cooling than water at the same temperature?

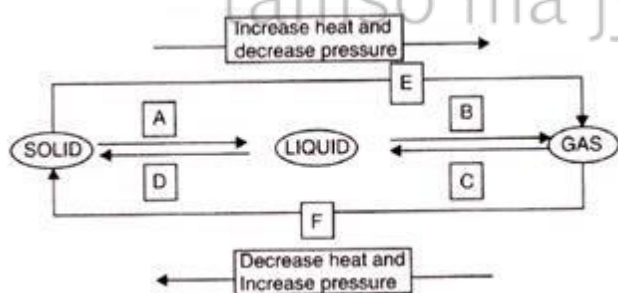
Ans.: 273 K or 0°C is the melting point of ice. Now, ice at 273 K is more effective in cooling a substance than water at the same temperature because in order to overcome the fusion to become water, ice at 273 K will absorb heat energy from the surroundings known as latent heat of fusion. Hence, the cooling effect of ice will be more than water at the same temperature because water does not absorb this extra heat from the medium.

The latent heat of melting of ice is 334 Joules per kilogram

Q.8 What produces more severe burns - boiling water or steam?

Ans.: Particles in steam, that is, water vapour at 373 K (100°C) have more energy than water at the same temperature. This is because particles in steam have absorbed extra energy in the form of latent heat of vaporisation. When steam tends to cool down, first steam condenses to water on skin and then water tends to cool down to the temperature of the skin. Since steam gives out much more heat than boiling water, it causes more severe burns.

Q.9 Name A, B, C, D, E and F in the following diagram showing changes in state:



Ans.: (i) In process A, a solid is changing into a liquid. Hence, A is melting or fusion.

The temperature at which a solid melts to become a liquid at the atmospheric pressure is called its melting point.

(ii) In process B, a liquid is changing into a gas. B is evaporation. The temperature at which a liquid starts boiling at the atmospheric pressure is known as its boiling point. Boiling is a bulk phenomenon. Particles from the bulk of the liquid gain enough energy to change into the vapour state.

(iii) In process C, a gas is changing into a liquid. C is condensation.

(iv) In process D, a liquid is changing into a solid. D is solidification.

(v) In process E, a solid is directly changing into a gas. E is sublimation which is done under increased heat and decreased pressure.

(vi) In process F, a gas is changing directly into a solid. F is also sublimation which is done under decreased heat and increased pressure.

The process of change of state of solid directly into a gas without changing into liquid state (or vice versa) is called sublimation

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1. Share your valuable resources with the group.
2. Help your fellow educators by answering their queries.
3. Watch and engage with shared videos in the group.
4. Distribute WhatsApp group resources among your students.
5. Encourage your colleagues to join these groups.

Additional notes:

1. Avoid posting messages between 9 PM and 7 AM.
2. After sharing resources with students, consider deleting outdated data if necessary.
3. It's a NO Nuisance groups, single nuisance and you will be removed.
 - No introductions.
 - No greetings or wish messages.
 - No personal chats or messages.
 - No spam. Or voice calls
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SKILL MODULES BEING OFFERED IN MIDDLE SCHOOL



Artificial Intelligence



Beauty & Wellness



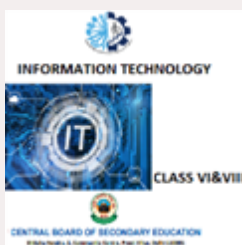
Design Thinking & Innovation



Financial Literacy



Handicrafts



Information Technology



Marketing/Commercial Application



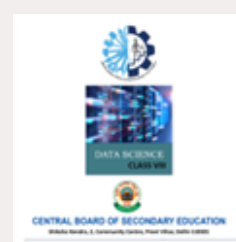
Mass Media - Being Media Literate



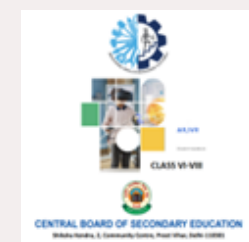
Travel & Tourism



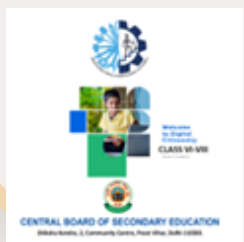
Coding



Data Science (Class VIII only)



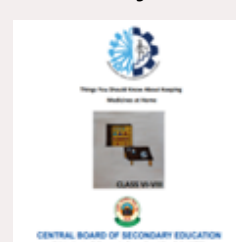
Augmented Reality / Virtual Reality



Digital Citizenship



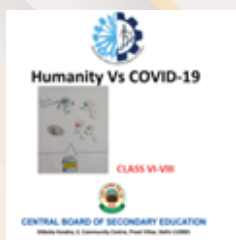
Life Cycle of Medicine & Vaccine



Things you should know about keeping Medicines at home



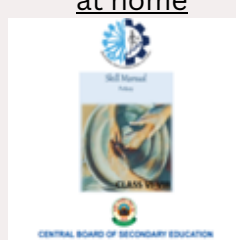
What to do when Doctor is not around



Humanity & Covid-19



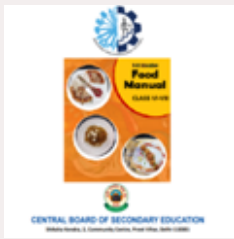
Blue Pottery



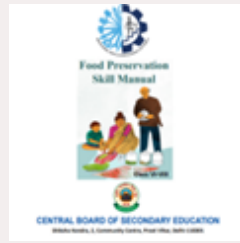
Pottery



Block Printing



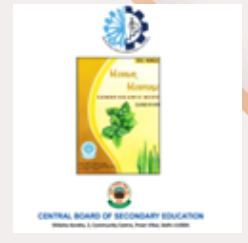
Food



Food Preservation



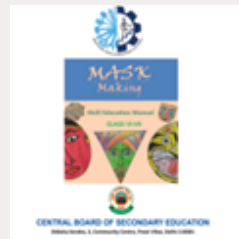
Baking



Herbal Heritage



Khadi



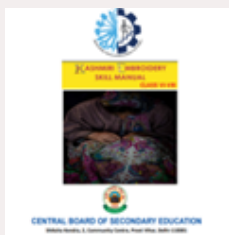
Mask Making



Mass Media



Making of a Graphic Novel



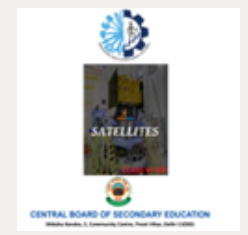
Kashmiri Embroidery



Embroidery



Rockets



Satellites

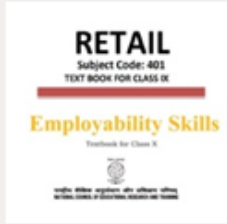


Application of Satellites

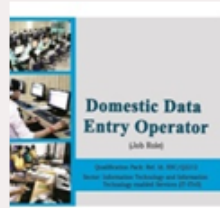


Photography

SKILL SUBJECTS AT SECONDARY LEVEL (CLASSES IX – X)



Retail



Information Technology



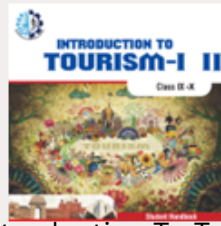
Security



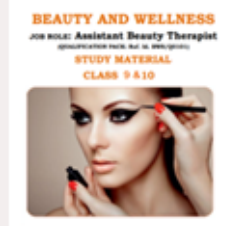
Automotive



Introduction To Financial Markets



Introduction To Tourism



Beauty & Wellness



Agriculture



Food Production



Front Office Operations



Banking & Insurance



Marketing & Sales



Health Care



Apparel



Multi Media



Multi Skill Foundation Course



Artificial Intelligence



Physical Activity Trainer



Data Science



Electronics & Hardware (NEW)

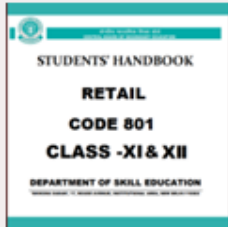


Foundation Skills For Sciences (Pharmaceutical & Biotechnology)(NEW)

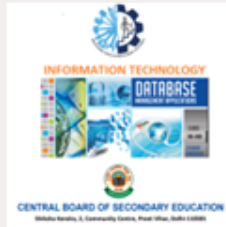


Design Thinking & Innovation (NEW)

SKILL SUBJECTS AT SR. SEC. LEVEL (CLASSES XI – XII)



Retail



Information Technology



Web Application



Automotive



Financial Markets Management



Tourism



Beauty & Wellness



Agriculture



Food Production



Front Office Operations



Banking



Marketing



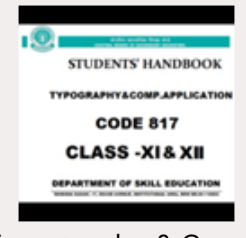
Health Care



Insurance



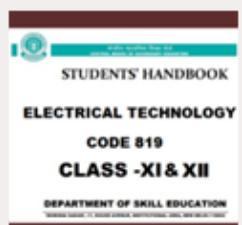
Horticulture



Typography & Comp.
Application



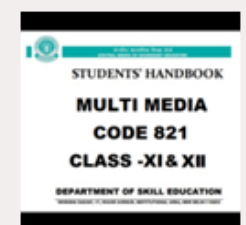
Geospatial Technology



Electrical Technology



Electronic Technology



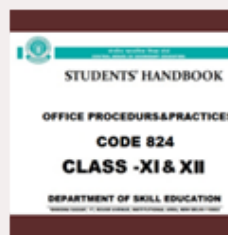
Multi-Media



Taxation



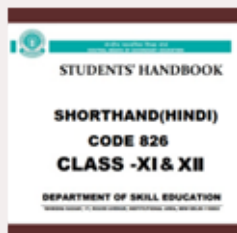
Cost Accounting



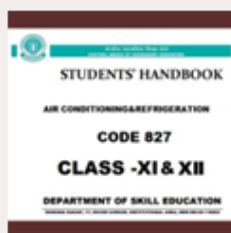
Office Procedures & Practices



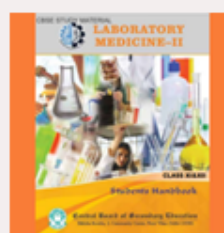
Shorthand (English)



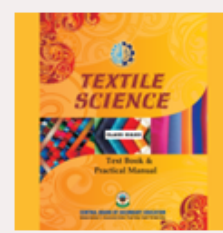
Shorthand (Hindi)



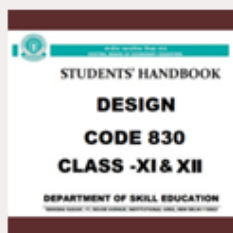
Air-Conditioning & Refrigeration



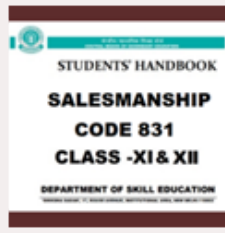
Medical Diagnostics



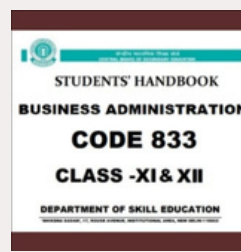
Textile Design



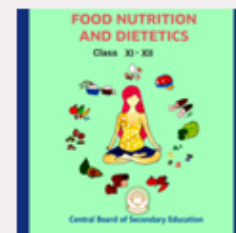
Design



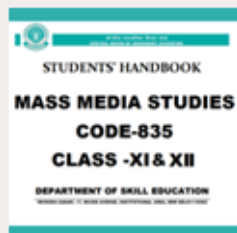
Salesmanship



Business Administration



Food Nutrition & Dietetics



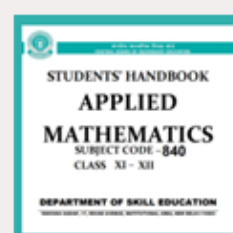
Mass Media Studies



Library & Information Science



Fashion Studies



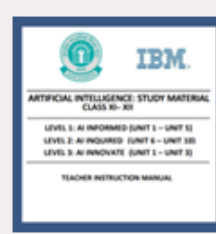
Applied Mathematics



Yoga



Early Childhood Care & Education



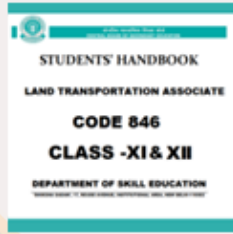
Artificial Intelligence



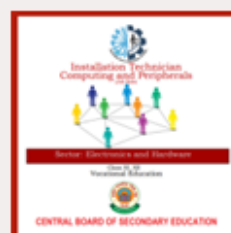
Data Science



Physical Activity Trainer(new)



Land Transportation Associate (NEW)



Electronics & Hardware (NEW)



Design Thinking & Innovation (NEW)

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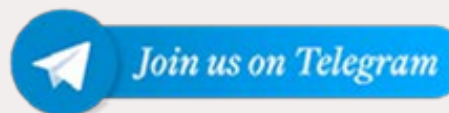
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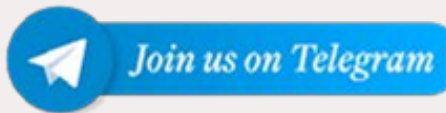
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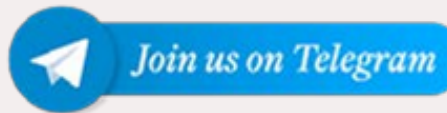
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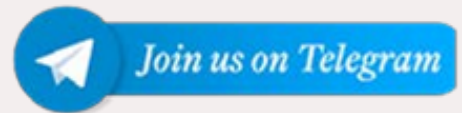
Kindergarten



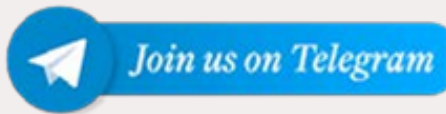
All classes



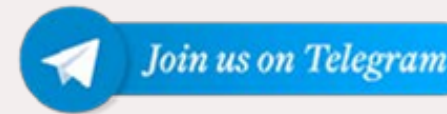
Class 1



Class 2



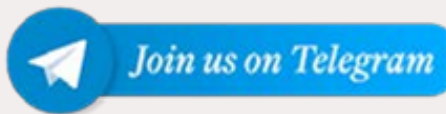
Class 3



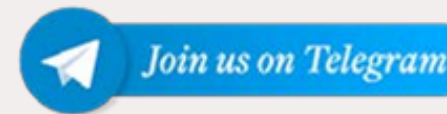
Class 4



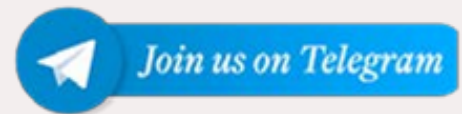
Class 5



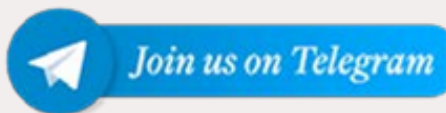
Class 6



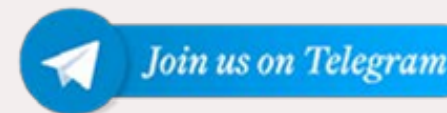
Class 7



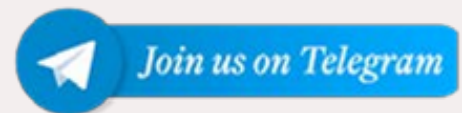
Class 8



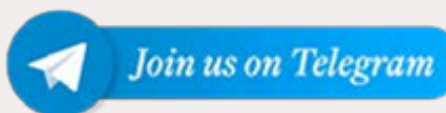
Class 9



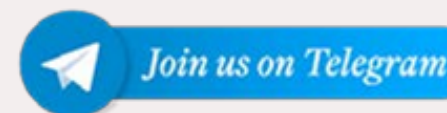
Class 10



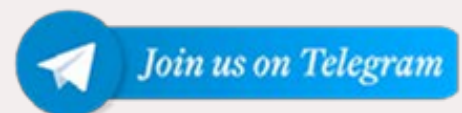
Class 11 (Sci)



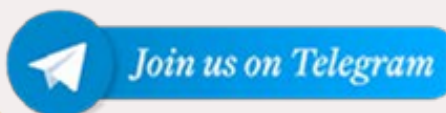
Class 11 (Com)



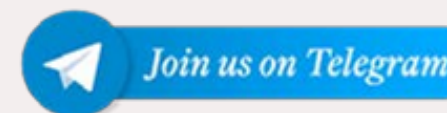
Class 11 (Hum)



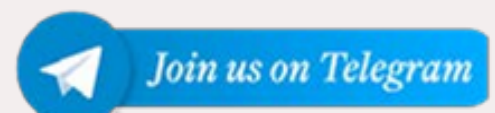
Class 12 (Sci)



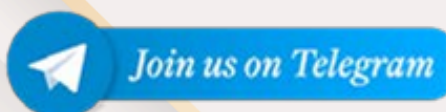
Class 12 (Com)



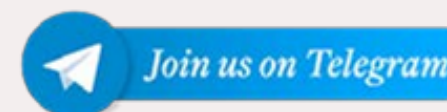
Class 12 (Hum)



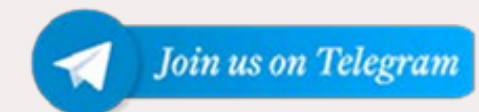
JEE/NEET



CUET



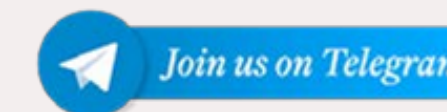
NDA, OLYMPIAD, NTSE



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Class 9



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Class 10



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Class 11 (Com)



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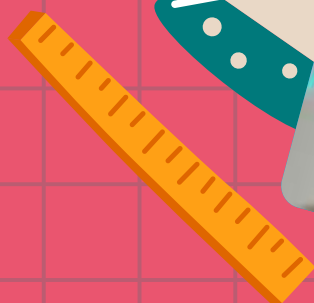
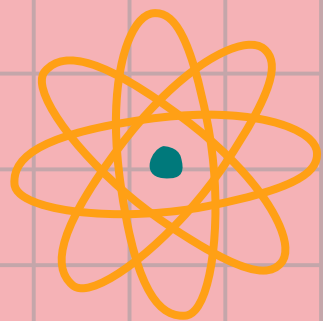
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